PTO 10-5032

CC=JP
DATE=19840914
KIND=A
PN=59163128

# STERILE PACKAGING METHOD FOR LIQUID FOOD PRODUCT
[EKIJO SHOKUHIN NO MUKIN JUTEN HOSO HOHO]

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UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. JULY 2010
TRANSLATED BY: SCHREIBER TRANSLATIONS,INC.

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| PUBLICATION COUNTRY | (10): | JP |
| DOCUMENT NUMBER | (11): | 59163128 |
| DOCUMENT KIND | (12): | A |
| PUBLICATION DATE | (43): | 19840914 |
| APPLICATION NUMBER | (21): | 58030045 |
| APPLICATION DATE | (22): | 19830224 |
| INTERNATIONAL CLASSIFICATION | (51): | B65B 55/02 |
| PRIORITY COUNTRY | (33): | N/A |
| PRIORITY NUMBER | (31): | N/A |
| PRIORITY DATE | (32): | N/A |
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| DESIGNATED CONTRACTING STATES | (81): | N/A |
| TITLE | (54): | STERILE PACKAGING METHOD FOR LIQUID FOOD PRODUCT |
| FOREIGN TITLE | [54A]: | EKIJO SHOKUHIN NO MUKIN JUTEN HOSO HOHO |

# Specification

## 1. Title of the Invention

Sterile packaging method for liquid food product

## 2. Scope of Patent Claims

A sterile packaging method for a liquid food product, characterized in that a liquid food product through which an insert gas has been thoroughly bubbled in advance is sterilized at a high temperature for a short period of time so as to be rapidly cooled and is then packed and sealed in a sterile packaging container under an inert gas stream and sterile environment.

## 3. Detailed Description of the Invention

The present invention relates to a sterile packaging method for a liquid food product. More specifically, the present invention relates to a sterile packaging method for a liquid food product wherein not only can the microbiological deterioration of the liquid food product be prevented but also the oxidation caused by the oxygen can be prevented.

Known examples of methods for long term storage of food products include a method wherein a content which has been packed and sealed in a can or bottle is subjected to a sterilization treatment with boiling at a temperature of 100 degrees Celsius or less or compression heating at a temperature

of 100 degrees Celsius or more. However, in this method, since the heat transfer of the food product is insufficient, the sterilization in the central area of the can or bottle tends to become insufficient and, further; the portion adjacent to the surface is excessively heated, resulting in the deterioration of the product quality. In order to overcome the above-described drawbacks, a retort sterilization method has previously been developed wherein a food product is packed and sealed in a soft packaging pouch, the thickness of the resulting pouch is reduced, and the resulting pouch is subjected to a heat sterilization process; however, this method is far from a complete solution.

In the case of a low acid food product (i.e., low-pH food product), a hot filling method is adopted wherein such a food product which has been heated at a high temperature is immediately packed and sealed in a packaging container; however, the resulting package must be cooled and, further, due to the poor cooling efficiency, some problems are encountered, such as the deterioration of the product quality and an increase in the cooling cost.

In order to solve the above-described problems, a sterile packaging method for a food product has garnered attention. In this method, when a liquid food product, which has been sterilized at a high temperature for a short period of time, is rapidly cooled and is then packed and sealed in a sterile

packaging container, which has been sterilized in advance, under sterile environment. In this method, since a food product is sterilized at a high temperature for a short period of time and is then rapidly cooled, a high quality product can be obtained; however, in this case, since the food product is packed at a low temperature, the dissolved oxygen concentration in the food product is high, whereby the food product is oxidized by the oxygen during storage, which results in the high quality immediately after production not being maintained.

The present inventor conducted intensive research in order to solve the problems with the sterile packaging method and, as a result, discovered that an insert gas was first bubbled though a liquid food product to be sterile packed

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in order to reduce the dissolved oxygen as much as possible, the resulting food product was sterilized at a high temperature for a short period of time, was then rapidly cooled, and was packed and sealed in a sterile packaging container under an inert gas stream and sterile environment; hence, the amount of dissolved oxygen in the liquid food product could be reduced, thereby maintaining the high quality of the packed food product. The present invention is based on this discovery.

More specifically, the substance of the present invention resides in a sterile packaging method for a liquid food product,

characterized in that a liquid food product through which an insert gas has been thoroughly bubbled in advance is sterilized at a high temperature for a short period of time so as to be rapidly cooled and is then packaged and sealed in a sterile packaging container under an inert gas stream and sterile environment.

The present invention is described in greater detail below.

First, a liquid food product to be sterile packed, such as alcoholic beverages, juice, wine and rice wine, milk and soy milk, is introduced into an ingredient tank, and an inert gas is bubbled through the liquid food product in order to reduce the amount of dissolved oxygen, which is approximately 8 ppm at room temperature, as much as possible, preferably to a concentration of 1 ppm or less. In this case, when the ingredient tank is stirred, the amount of dissolved oxygen can be more efficiently reduced. Thereafter, the resulting food product is sterilized at a high temperature for a short period of time by an indirect heating method (heat exchange method) or a direct heating method (using steam), is then rapidly cooled at a temperature of 20 degrees Celsius or less and is stored in a storing tank optionally though a homogenizer. Thereafter, the resulting food product is packed and sealed in a packaging container, which has been sterilized in advance, under sterile environment and an inert gas stream. The reason for conducting the packing process

under an inert gas stream is that oxygen in the atmosphere is involved during packing in order to prevent an increase in the amount of dissolved oxygen and to prevent oxygen from entering the head space of the packaging container. Examples of inert gases that can be used in the present invention include $N_2$, He, Ne and Ar. Examples of packaging containers that can be used in the present invention include cans, bottles, paper composite containers, and plastic containers, with any of the above-enumerated containers with high gas barrier properties being particularly preferred.

As described above, in accordance with the present invention, the amount of dissolved oxygen in the food product can be reduced, thereby maintaining the high quality of the sterile packed food product for an extended period of time.

Next, the present invention is described in greater detail below with reference to an embodiment.

Embodiment

An inert gas (nitrogen gas) was thoroughly bubbled through 100% concentrated orange juice, was then sterilized at a temperature of 95 degrees Celsius for 2 seconds by an indirect heating method, was then rapidly cooled such that the product temperature was 20 degrees Celsius or less, was finally sterile packed in a metal can which had been sterilized in advance under sterile environment and an insert gas (nitrogen gas) stream.

Meanwhile, by a conventional sterile packaging method (using an indirect heating method), the same orange juice was sterilized at a temperature of 95 degrees Celsius for 2 seconds, was then rapidly cooled such that the product temperature was 20 degrees Celsius or less, was finally sterile packed in a metal can which had been sterilized in advance under sterile environment and an insert gas stream.

The initial amount of dissolved oxygen and the initial amount of vitamin C of the products which had been packed by the above-described three packaging methods were measured and the amount of vitamin C and the taste of the products after storage at a temperature of 37 degrees Celsius for 3 months were also investigated.

The results are shown in the following table.

| Test Classification | Initial Dissolved Oxygen Amount | Initial Vitamin C Amount | Vitamin C Amount after Storage | Taste |
|---|---|---|---|---|
| Inventive Sterile Packaging Method | 0.7 ppm | 35 mg% | 29 mg% | |
| Conventional Sterile Packaging Method | 8.8 ppm | 35 mg% | 15 | Oxidized Odor |
| Hot Filling Method | 0.6 ppm | 35 mg% | 28 | Heated Odor |

As is clear from the table, in accordance with the inventive sterile packaging method, the fresh taste of orange juice can be maintained while preventing vitamin C from being oxidized and reduced.

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